

# ATTRIBUTE PREFERENCES AND WILLINGNESS TO PAY FOR FORTIFIED CEREAL FOODS IN BOTSWANA

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## ABSTRACT

Studies conducted in the early 1990s by the Ministry of Health in Botswana among children and women of childbearing age revealed widespread malnutrition problems in that country. Fortification of food is viewed as a means of overcoming some of the problems associated with poor nutrition. This study analyses the market for fortified cereal foods in Botswana. The specific objectives of the study are to: (1) determine the importance of various product attributes of cereal products in influencing the purchasing decision of consumers in Botswana, (2) assess the willingness of consumers in Botswana to pay for fortified cereal foods, and (3) develop recommendations to guide private strategy and public policy for fortification in Botswana. The study is based on primary data collected from 452 consumers in Gaborone and the south-east administrative districts using a clustered sampling approach. Results show that, for consumers, the most important attributes, listed in order of importance, were product brand, product quality, price, colour/appearance and nutritional value. Consumers knew little about fortified foods. There is a close correlation between residential area and knowledge about fortified foods, with rural residents having the least knowledge. Willingness to pay for fortified milled products was very low among consumers owing to limited knowledge about fortification and its benefits. The segment-target-position (STP) framework is used to develop strategic recommendations for a market-led fortification programme.

Keywords: Botswana, fortified cereals, willingness to pay

## 1 INTRODUCTION AND BACKGROUND

Vitamins and minerals are essential components of a healthy diet, ensuring physical and mental growth and vitality, and protecting against disease and premature death. In 2000, the *World health report* (WHO, 2000) identified iodine, iron, vitamin A and zinc deficiencies as being among the world's most serious health risk factors. According to the report, 30 per cent of the world's population is affected by vitamin A, iron or iodine deficiency. About 700 million people suffer from clinical forms of these deficiencies, and another 2 billion from sub-clinical forms. Apart



from these three major public health problems, deficiencies in other micronutrients such as zinc, calcium, folic acid and other vitamins are widely prevalent in the developing world. A large proportion of the populations suffering from these deficiencies live in developing countries of Africa. The estimated prevalence of iron deficiency in children under five years in 2000 ranged from 31 per cent to 85 per cent while the estimated prevalence of children under six years with a sub-clinical vitamin A deficiency ranged from 7 per cent to 70 per cent (WHO, 2000). According to Gnagbe (2006), the effects of micronutrient malnutrition, such as blindness, anaemia and goitre, are known and are well reported in the literature; in more recent years, however, scientific research has revealed that the impact of micronutrient deficiencies (MNDs) extends far beyond these effects. Other, more subtle but far-reaching effects include inability to achieve full mental and physical potential owing to stunted growth, low physical work capacity, reduced IQ and lower resistance to infection. Micronutrient malnutrition therefore poses a serious threat to national health and development, as it contributes substantially to the global burden of disease. In both developed and developing countries, including those in Africa, there is now a growing interest in finding sustainable solutions to reducing micronutrient malnutrition.

Studies conducted in the 1990s by the Ministry of Health in Botswana among children and women of childbearing age revealed that nutritional problems in Botswana resulted from a variety of causes, including inadequate food intake, predisposition to diseases such as tuberculosis and human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS), inadequate maternal care and childcare practices, poverty and food insecurity, ignorance, social taboos, and lifestyle choices. Women, particularly those of childbearing age, children under five years old, and people infected with HIV/AIDS were identified as the groups most vulnerable to MNDs. Protein-energy malnutrition and iron, vitamin A, and iodine deficiencies were identified as some of the most common types of malnutrition in Botswana (Belbase *et al.*, 1996). The effects of these deficiencies ranged from underweight and stunting to anaemia, goitre, enlarged bellies, paleness, lack of energy, night blindness, dry eyes, inflammation of the eyes, dry skin, growth retardation, stillbirths and infant deaths, depending on the type of deficiency. Child malnutrition, measured by stunting, wasting and underweight, is considered a serious problem in Botswana, with 13 per cent of children under five moderately or severely underweight, 23 per cent suffering from moderate or severe stunting and 5 per cent suffering from moderate or severe wasting (Tharakan & Suchindran, 1999; UNICEF, 2008). Other studies have also revealed higher levels of malnutrition in children in Botswana from single-parent households, households with low earnings, households with low parental education and households in rural areas (Mahgoub *et al.*, 2006).

According to the Botswana Ministry of Health (Botswana, 2005), three broad categories of factors cause malnutrition: immediate factors, underlying factors, and basic factors. Immediate factors are those that account for the poor health status of an individual, and include inadequate dietary intake and the prevalence of diseases. They are the main causes of child mortality and morbidity in developing countries. Underlying factors include household food insecurity, inadequate maternal care and childcare practices, poor health services, and an unhealthy environment. Basic factors relate to the quantity and quality of human, economic, and organisational structures available and the way they are controlled in society.

Effective nutrition interventions are available to prevent malnutrition and its consequences. Short-term strategies such as nutrient supplementation (giving a large dose of the micronutrient as a medicinal supplement) have been effective in providing immediate relief in several countries, but there is concern that this approach is not sustainable in the long term. Food fortification is viewed as a more cost-effective and sustainable solution, and it plays a significant role in improving the diet and meeting the micronutrient needs of the population. Other strategies include dietary diversification, homestead production and improved food processing and storage (Reddy, 2003). The cost effectiveness of each mode of intervention depends on the specific nature of the MND, the local food production and consumption systems, available infrastructure, institutional arrangements and market forces. These factors will vary widely across both space and time. Similarly, the implementation plan and funding source for initiatives designed to combat malnutrition often involve strategic collaboration between private enterprises, non-governmental organisations (NGOs), civic organisations, and the public sector. The specific roles of each player depend on both the nature of the problem and the prevailing social, economic and political conditions.

The fortification of food has been practised for centuries in developed countries to improve its nutritional quality and to overcome problems associated with poor nutrition from MNDs. Fortification is broadly defined as the addition of specific amounts of one or more nutrients (vitamins and/or minerals) to foods in which they were either absent, or present in low quantities. This is usually done because deficiencies or potential deficiencies have been shown to exist in a particular population (Ottaway, 2008).

The advantage of fortification is that it can eliminate or reduce the occurrence of a number of common MNDs. The result of correcting these deficiencies is a general improvement in health (decreased mortality rate and normal growth and development), improved labour productivity, and a reduction in the expenses borne by the public health sector in treating the illnesses related to MNDs (World Bank, 2006).

Understanding the consumer is the keystone of any market-based solution to malnutrition. Any successful fortification programme, whether voluntary or mandatory, will need to take into account and fulfil the changing requirements of consumers. Using primary data from a recent survey, this article considers the consumers of milled products in Botswana to reveal their tastes and preferences for, awareness of and attitudes toward the fortification of milled products, and willingness to pay for fortification. To provide context, table 1 summarises the key macroeconomic factors that present opportunities and threats to the milling industry in Botswana.

**Table 1:** Macro-environmental factors influencing the milling industry in Botswana

Factor	Opportunities	Threats
Political, legal	<ul style="list-style-type: none"> <li>• Political stability in Botswana</li> <li>• Fair levels of regional harmonisation through Southern Africa Customs Union (SACU)</li> <li>• Few or no trade barriers between and within the respective countries</li> <li>• Movement toward buying local products</li> </ul>	<ul style="list-style-type: none"> <li>• Regional political instability</li> <li>• Poor development, implementation, and monitoring of food standards</li> <li>• No clear government policy on fortification</li> </ul>
Economic	<ul style="list-style-type: none"> <li>• Economic liberalisation well under way</li> <li>• High economic growth rates in recent years</li> <li>• Increase in foreign direct investments</li> <li>• Growing per capita income</li> <li>• Growing personal consumption</li> </ul>	<ul style="list-style-type: none"> <li>• Small size of economy compared with neighbouring countries</li> <li>• Legal barriers to trade</li> <li>• High interest rates</li> <li>• Rural subsistence farmers have limited participation in markets</li> <li>• Multinational companies from South Africa</li> </ul>
Social, cultural, demographic	<ul style="list-style-type: none"> <li>• Growing population, increasing market</li> <li>• Changing consumption patterns toward processed and value-added foods</li> <li>• Increased awareness of healthy lifestyles</li> <li>• Increasing rural to urban migration, increasing market</li> </ul>	<ul style="list-style-type: none"> <li>• HIV/AIDS, stagnant or decreasing population, stagnant or decreasing market</li> <li>• Cultural aversion to new products</li> <li>• Aversion to traditional/local products</li> <li>• Significant market located in rural areas</li> </ul>
Technological	<ul style="list-style-type: none"> <li>• Improved access to information (radio, television, cell phones and internet)</li> <li>• Advances in biotechnology</li> <li>• Advances in food-processing technology</li> <li>• Strong national scientific and research institutions and universities</li> </ul>	<ul style="list-style-type: none"> <li>• Young and underdeveloped food-processing industry in Botswana</li> <li>• Latest technologies favour large companies able to achieve economies of scale</li> </ul>

## 2 RESEARCH OBJECTIVES

The study reported on analysed the market for fortified cereals foods in Botswana. The analysis builds on an earlier study led by the Botswana Institute for Development Policy Analysis (BIDPA) on the feasibility of mandatory fortification of cereals in Botswana (Seleka *et al.*, 2008). The main objective of the study was to appraise the potential for a cereal fortification market in Botswana, and the specific objectives were to:

- 1 determine the importance of various product attributes of cereal products in influencing the purchasing decision of consumers in Botswana;
- 2 assess the willingness of consumers in Botswana to pay for fortified cereal foods;
- 3 develop recommendations to guide private strategy and public policy for fortification in Botswana.

## 3 LITERATURE REVIEW

### 3.1 Willingness to pay

Willingness to pay (WTP) can be defined as the maximum amount a consumer would be willing to pay, sacrifice or exchange for a good or service (Al-Ghuraiz & Enshassi, 2005). In addition to indicating a positive attitude towards a particular good or service, WTP also indicates the strength of that attitude constrained by current factors such as existing alternatives and ability to pay (Whitehead, 2005; Jones-Lee, 1985). An implicit assumption in measuring WTP is that individuals who report a positive WTP should be both willing and able to pay the price if offered the product or service (Russell, 1996).

The economic and business literature contains a wide selection of competing approaches and analytical techniques for measuring WTP. There are two broad approaches for eliciting WTP. The first approach, commonly referred to as revealed preference, establishes WTP indirectly by examining market prices in binding market transactions. In terms of the second approach, WTP may be elicited directly by “asking consumers through carefully orchestrated elicitation methods”. The latter approach, commonly referred to as contingent valuation (CV) or “stated preference”, directly elicits consumers’ WTP for a non-marketed good or service under a set of given conditions. Because of its ability to measure WTP values for non-marketed goods, the CV approach is commonly used in environmental preservation studies. It is important to note that the elicited WTP values of a good or service under the CV method are “contingent upon” the hypothetical market prescribed in the survey instrument (Lipton *et al.*, p.50). Four types of elicitation methods are commonly used in CV studies, namely open-ended questions, bidding game, single-bound dichotomous-choice and double-bound dichotomous-

choice. Each method must be carefully designed to minimise the effect of key shortcomings of the CV method, including strategic behaviour by respondents, protest answers, response bias and respondents ignoring income constraints (Diamond & Hausman, 1994). In situations of good design and implementation techniques, the CV method has been empirically proven to compare well with actual behaviour (Vossler & Kerkvliet, 2003; Griffin *et al.*, 1995; Choe *et al.*, 1996).

### 3.2 Recent food security, nutrition and fortification policies

The food security, nutrition and fortification policy landscape in Africa has, in recent times, been driven by the AU-NEPAD Comprehensive Africa Agricultural Development Programme (CAADP) Pillar 3, entitled “Increasing food supply, reducing hunger and improving responses to food emergency crises”. CAADP is an initiative of the AU (African Union) and NEPAD (New Partnership for Africa’s Development) to revitalise African agriculture so as to stimulate economic growth, permanently reduce poverty and achieve food and nutrition security on the continent. The CAADP is complemented by the Thematic Working Group on Agriculture and Food Security of the Millennium Development Goals (MDG) initiative for Africa established under the auspices of the United Nations (UN) and AU (AU-NEPAD, 2008).

As of 2006, the AU and NEPAD have focused on the need for national implementation of food security and nutrition programmes based on the principles outlined in the CAADP through national round table events. These round table events are aimed at engaging key stakeholders in each country to reach consensus on the implementation of programmes to achieve the goals of the CAADP. To further the round table process and to assist with the identification of early actions to combat food insecurity, NEPAD has developed the Framework for African Food Security (FAFS), The Pan African Nutrition Initiative (PANI) and the Africa Ten Year Strategy for the Reduction of Vitamin and Mineral Deficiencies (ATYS-VMD) to guide the regional economic communities such as the Southern African Development Community (SADC) and Economic Community of West African States (ECOWAS), and individual countries with their programme planning (AU-NEPAD, 2008).

### *3.2.1 The Framework for African Food Security*

The purpose of the FAFS programme is to guide and assist stakeholders in Africa to meet the objectives of CAADP Pillar 3 and the broader African development agenda simultaneously. The FAFS aims to provide principles, recommended actions, coordination, peer review and tools to guide national and regional policies, strategies, investments, partner contributions and advocacy efforts to overcome these challenges, leading to increased food supply, reduced hunger and malnutrition, and improved food security risk management (AU-NEPAD, 2008).

### *3.2.2 Pan African Nutrition Initiative*

Through the development and endorsement of the CAADP in 2003 by African leaders, food insecurity, hunger and malnutrition were identified as major problems in Africa that required immediate action. Subsequently, during the CAADP regional consultations during 2004 to 2006, it became clear that nutrition issues were not adequately reflected in the AU-NEPAD CAADP processes. To rectify this, it was decided that a robust tool and guiding document was required to effectively deal with the multi-sectoral and crosscutting nature of nutrition, and help all relevant sectors to recognise their contribution and role in reducing hunger and malnutrition. Thus the PANI was born. The PANI was drafted through a multi-stakeholder consultative process in 2005 and further refined until its final form was achieved in 2008. The problems of and, more important, the solutions to food insecurity and malnutrition, as articulated in the PANI, are seen through what has been dubbed the “nutrition lens”, a tool for analysis, planning and programme delivery (NEPAD-CAADP, 2009).

### *3.3.3 Africa Ten Year Strategy for the Reduction of Vitamin and Mineral Deficiencies*

The ATYS-VMD framework for Africa is an addition to the broader FAFS. NEPAD, the Global Alliance for Improved Nutrition (GAIN), the Development Bank of Southern Africa (DBSA), the United Nations Children’s Fund (UNICEF), Helen Keller International (HKI), Micronutrient Initiative (MI), and World Food Programme (WFP) developed a concise strategy for Africa to eradicate vitamin and mineral deficiencies. These strategies are aimed at supporting the regional economic communities and national governments in implementing food fortification projects, supplementation as well as food-based approaches to reduce vitamin and mineral deficiencies (Innovations Report, 2006).

In partnership with regional economic communities and national governments, NEPAD has driven the development and implementation of all three of these policy

frameworks and policy tools as part of their mandate in terms of the Millennium Development Goals for Africa.

### 3.3 The milling industry in Botswana

A survey was conducted in 2006 to assess the feasibility of mandatory fortification of cereals in Botswana (Seleka *et al.*, 2008). Since the research reported on here builds on the report emanating from that study, in this section we summarise its key findings.

The survey found that 57 sorghum, maize, and millet millers were registered with the Ministry of Agriculture, 41 of which were surveyed. Of the 57 registered firms, 50 were operational in 2006. Of these, 8 firms were identified as large, 14 as medium, and 28 as small.<sup>2</sup> The majority of the firms surveyed (68 per cent) were engaged solely in sorghum milling; about 15 per cent engaged in sorghum and millet milling; 10 per cent in sorghum and maize milling; and 7 per cent in sorghum, maize, and millet milling. Sorghum milling was clearly the major activity in terms of the number of firms involved, as all the firms engaged in it either as their sole activity or in conjunction with other activities. Only sorghum milling occurred as a sole activity, and the milling of maize and millet was undertaken together with sorghum milling.

The analysis shows that, cumulatively by size group, small, medium, and large firms milled about 146, 666, and 4373 metric tons of sorghum per month respectively. Most of the sorghum in Botswana was processed by 8 large firms, followed by 14 medium firms and 19 small firms. The maize processing sector is also highly concentrated, with only small and large firms operating in this sector. The small maize processing firms collectively produced about 32 metric tons of flour per month, while large firms produced about 550 metric tons per month. All the firms processing millet were small, and collectively produced about 3 tons of flour per month.

The report concludes that cereal milling in Botswana is carried out largely by small firms. In an industry that relies on economies of scale, this puts Botswana millers at a competitive disadvantage compared with their larger competitors from South Africa. Cost analysis reflected in this report indicated that “the probability of millers being able to afford to fortify increases with firm size. The unit cost of fortification is P0.27, P0.12 and P0.06 per kilogram of sorghum flour for small-, medium- and large-scale millers, respectively” (Seleka *et al.*, 2008 p.66). For a 10 kg bag these costs would translate into a cost increase of between P2.70 and P0.60 depending on the size of the miller. If the entire costs were to be transferred to the consumer, fortification would result in a significant price increase that would be beyond the reach of most consumers (Seleka *et al.*, 2008).



## 4 RESEARCH METHODS AND DATA

The study reported on in the present article used both primary and secondary sources of information to guide the analysis. The main source of secondary information was the report by Seleka *et al.* (2008), containing an evaluation of the economic feasibility of mandatory fortification of cereals in Botswana. Primary data was collected from consumers in Gaborone and the south-east administrative districts using a clustered sampling approach. A questionnaire was used to gather information on consumers' purchasing behaviour, attitudes toward fortified milled products, knowledge about fortified products, willingness to pay for fortified milled products, and demographic characteristics. In all, 452 consumers were interviewed in the following locations (the numbers in parenthesis represent consumers interviewed for each area): Gaborone North (88), Gaborone South (88), Gaborone Central (88), Gaborone West (88), Ramotswa (30), Tlokweng (30), Mogobane (20), and Otse (20). A deliberate effort was made to visit different parts of Gaborone in order to include households and consumers from different income categories and to visit urban (Gaborone), peri-urban (Ramotswa and Tlokweng), and rural areas (Mogobane and Otse). In Gaborone, 352 out of 58,476 households were sampled, which represented 0.6 per cent of total households in Gaborone. In the south-east district, 100 out of 14,780 households were sampled, which represented 0.7 per cent of total households.

In addition to formal interviews with consumers and visits to retailers and wholesalers, a number of interviews were held with relevant stakeholders. These included Botswana Bureau of Standards (BOBS), millers, retailers, the National Food Technology Research Centre (NFTRC), the Food and Nutrition Unit of the Ministry of Health, the Ministry of Agriculture, and the Botswana Agricultural Marketing Board (BAMB).

Table 2 summarises the demographic characteristics of consumers interviewed. Of the 452 respondents, 169 (33 per cent) were male and 303 (67 per cent) were female. Given that respondents were randomly sampled at shopping centres, the higher percentage of female respondents suggests that household chores such as buying groceries and food preparation are activities carried out predominantly by women in Botswana. The majority of respondents (72 per cent) were below the age of 30, and the majority lived in households ranging in size from 1 to 6 persons. Regarding educational level, only 17 (4 per cent) of the respondents reported never having had any formal schooling, while 56 (12 per cent) had attended school up to primary level. Of the remaining respondents, 14 per cent had up to junior secondary, 24 per cent senior secondary and 46 per cent post-secondary school qualifications. This relatively high level of education is not surprising, given that data was collected in Gaborone and peri-urban areas near Gaborone. With regard to income level, about 42 per cent of the population earned less than P600<sup>3</sup> and

were therefore living below the poverty datum line (UNDP, 2006). About 43 per cent earned between P500 and P2000, 11 per cent earned between P2001 and P6000, while the remaining 4 per cent earned above P6000 per month.

**Table 2:** Demographic characteristics of consumers interviewed

Variable	Category	Frequency	Percent
Gender	Male	149	33
	Female	303	67
Age (years)	≤30	324	71.7
	31–40	88	19.5
	41–50	25	6.5
	51–60	12	2.7
	61–70	2	0.4
	>70	1	0.2
Household size	1–3	232	51.3
	4–6	153	33.8
	7–9	50	11.1
	10–12	10	2.2
Education (years of schooling)	0	17	4
	1–7	56	12
	8–9	63	14
	10–11	108	24
	≥12	208	46
Income, monthly (pula)	0–500	190	42
	501–2,000	196	43
	2,001–4,000	32	7
	4,001–6,000	18	4
	6,001–8,000	5	1.5
	8,001–10,000	3	0.7
	10,001–12,000	4	0.9
	>12,000	4	0.9

## 5 ANALYSIS AND RESULTS

### 5.1 Consumer tastes and preferences

Consumers were asked to use a scale of 1 to 10 (1 being not important and 10 being extremely important) to indicate the importance of various product attributes and characteristics in their choice of milled product purchases. Table 3 summarises the descriptive statistics (mean, and standard deviation) for each product attribute. A brief discussion of each product attribute is given in the numbered paragraphs below, which appear in order of importance according to the average response. Where applicable, the implications for fortification are explored.

**Table 3:** Descriptive statistics of desired product attributes

Product attribute	Mean	Standard deviation
1 Brand	7.37	1.588
2 Quality	7.33	1.611
3 Price	7.17	1.963
4 Colour and appearance	7.01	1.953
5 Healthy/Nutritious	6.31	2.176
6 Made in Botswana	4.55	1.879
7 Natural food	4.07	1.965
8 Made in South Africa	3.38	1.695
9 Organic	2.71	1.611

1. **Brand:** Rather surprisingly, consumers had a strong brand preference when purchasing milled cereal products. Consumers will purchase only the brand that they know, and are highly likely to be loyal to one brand. This loyalty has serious negative implications for new entrants into the milling industry, such as small and medium-sized millers, who will find it hard to induce a trial of a new brand.
2. **Quality:** Consumers showed a strong preference for good and consistent quality. An earlier study by Kebakile *et al.* (2003) indicated that consumers defined sorghum quality in terms of its colour, texture and taste. This high score may favour local millers, who have a better understanding of local preferences. For fortified goods to be accepted, they will have to be perceived by consumers to be of equal or better quality than unfortified products.
3. **Price:** Given the limited disposable income of the average consumer, it is expected that demand for any milled product will be price elastic. If fortification of milled products results in higher prices, there is likely to be significant

consumer resistance. Since the targeted beneficiaries of any fortification programme are likely to be the poor and vulnerable, who are the most price sensitive, any voluntary fortification programme is likely to fail without government intervention to subsidise the additional cost of fortification.

4. **Colour and appearance:** As noted before, in the previous study by Kebakile *et al.* (2004), Botswana consumers consider colour an important characteristic of milled sorghum. This preference, however, significantly limits the production base to a particular variety that is not widely available on international markets. This attribute is likely to result in significant complications for the fortification process. Many minerals and vitamins are light sensitive, and consequently fortified products cannot be packaged in transparent bags, as most of the currently unfortified products are. Opaque packaging, required to preserve the efficacy of the vitamins and minerals, could potentially be perceived as a disguise for an undesirable product colour. To help mitigate this potential drawback, if at all possible, the fortification process should not significantly alter the colour and appearance of the product. The perception of millers is that micronutrients such as iron cannot be used because it will alter the colour (Personal communication). However, this may not always be the case, as a study conducted by Motswagole *et al.* (2006) involving the use of iron and vitamin A in a fortified sorghum flour indicated that changes in colour after fortification are dependent on the form of the nutrient that is used.
5. **Healthy/Nutritious:** While the score for a healthy and nutritious product is relatively high, it is important to note that this attribute ranks only fourth. The main benefit of fortification is related to health; therefore, for fortified products to be accepted by consumers, they will have to be marketed based not only on their nutritional value but also on the attributes more important to consumers, namely brand, quality, and price.
6. **Made in Botswana:** This attribute was slightly important to consumers. This “buy local” preference will favour local millers. There is potential to increase the ranking of this attribute if there were a national campaign promoting the benefits of buying locally, such as the “Proudly South African” campaign that promotes the local consumption of South African products.
7. **Natural:** The fact of milled products being natural was considered only slightly important. This may mean that the product has not been genetically modified or does not contain artificial additives in the form of colorants and flavourants. Given the current use of food additives globally and the growing use of genetically modified products on the international markets (South Africa included), this factor could further limit the production basis and sourcing options for raw material, and ultimately favour the local production of natural cereals.

8. **Made in South Africa:** A small segment of the population favoured products from South Africa. These consumers may perceive South African products to be of better quality than Botswana brands. Encouragingly, this preference ranks lower than that for home-grown products.
9. **Organic:** This factor was ranked lowest by consumers. Very few, possibly elite, consumers had a preference for organic products. Millers could take advantage of this as a niche market and charge a premium for organic products. It is unclear whether the notion of fortification may be perceived as negating the organic nature of the product; consumers who prefer organic foods generally do not favour the addition of artificial ingredients.

## 5.2 Knowledge about fortified products

When consumers were asked whether they knew about fortified food products, the majority (58 per cent) indicated that they knew nothing, 40 per cent said that they had limited knowledge, while only 2 per cent indicated that they knew a lot about fortified food products. As suspected, there was a strong correlation between residential area and knowledge about fortified foods. Table 4 is a cross tabulation of consumer responses and residential area. While urban areas and major villages share similar results, there is little knowledge about fortified foods in rural areas, which suggests that any educational campaign that seeks to raise awareness of the advantages of fortified foods will have to target rural areas more aggressively. Similar results were obtained when consumers were asked whether they knew about fortified milled products in particular.

**Table 4:** Knowledge about fortified food products (residential area cross tabulation)

Knowledge about fortified food products		Residential area			Total
		Urban	Major village	Rural area	
Know nothing	Count	154	57	50	261
	% within residential area	56.6 per cent	55.3 per cent	65.8 per cent	57.9 per cent
Limited knowledge	Count	112	43	26	181
	% within residential area	41.2 per cent	41.7 per cent	34.2 per cent	40.1 per cent
Know a lot	Count	6	3	0	9
	% within residential area	2.2 per cent	2.9 per cent	0.0 per cent	2.0 per cent
Total	Count	272	103	76	451
	% within residential area	100.0 per cent	100.0 per cent	100.0 per cent	100.0 per cent

### 5.3 Willingness to pay for fortified products

When consumers were asked whether they would be willing to pay more for fortified products, the overwhelming majority (over 70 per cent) indicated that they would not. Of the remaining respondents, who indicated that they would be willing to pay more, the majority said they would pay a premium of 5 per cent or less. Only a small minority indicated willingness to pay more than 5 per cent more for fortified products. Table 5 shows the results for willingness to pay for various fortified products.

**Table 5:** Consumers' willingness to pay more for fortified products

Willingness to pay: product	Nothing	5 per cent more	More than 5 per cent more	Total
Sorghum	71.0 per cent	21.6 per cent	7.4 per cent	100.0 per cent
Maize	70.8 per cent	21.1 per cent	8.1 per cent	100.0 per cent
Millet	76.1 per cent	18.2 per cent	5.7 per cent	100.0 per cent
Instant porridge	75.0 per cent	18.9 per cent	6.1 per cent	100.0 per cent
Wheat flour	72.3 per cent	20.0 per cent	7.7 per cent	100.0 per cent

Given the overwhelming lack of willingness to pay more for fortified foods, further analysis by income, education, gender, and residential area was abandoned. The

most important information is that consumers in Botswana are unwilling to pay extra for fortified milled products. The implications of this finding are twofold.

First, and most important, the results suggest that any voluntary fortification system is likely to fail, as most consumers will continue to buy the cheaper, unfortified product, and there will be little demand for fortified products. Cost analysis conducted by Seleka *et al.* (2008 p.7) indicated that “the probability of millers being able to afford to fortify increases with firm size. The unit cost of fortification is P0.27, P0.12 and P0.06 per kilogram of sorghum flour for small-, medium- and large-scale millers, respectively.” For a 10 kg bag these costs would translate to a cost increase of between P2.70 and P0.60 per 10 kg bag, depending on the size of the milling company. If the entire cost were to be transferred to the consumer, fortification would result in a significant price increase. To avoid price competition between fortified and unfortified products, the government of Botswana would have to introduce a compulsory national fortification scheme for a specific food or range of frequently consumed foods or pay the extra costs incurred in fortification so as to keep prices equal. This could be taken as a short-term measure until consumers start to appreciate the benefits of fortification.

Second, the extremely low willingness to pay more for fortified products can be taken as a reflection of limited knowledge about the benefits of fortification. The results for willingness to pay have to be interpreted with caution, though, given that rational consumers are unwilling to pay extra for a product feature whose benefit they do not understand. It is therefore recommended that the government embark on an aggressive public engagement campaign to inform consumers about the meaning and advantages of cereal fortification. Once this information has been disseminated, willingness to pay can be measured again by means of a similar survey before the government determines the extent of any subsidies. When consumers have tried a few fortified products, the health benefits are likely to become self-evident. It is hoped that this will increase willingness to pay for fortified products. Initial trial by early adopters could also induce word-of-mouth awareness, which would further accelerate the adoption process and increase willingness to pay.

## 6 STRATEGIC RECOMMENDATIONS

The segment-target-position (STP) framework is used in the development of strategic recommendations for fortified milled products. STP is the process for developing marketing strategy through segmenting the market, targeting a segment, and then positioning the product or brand.

The first step in developing strategic recommendations for fortified cereal in Botswana is to divide the market into segments. Based on our discussions and consultation with millers, four variables (age, education, geographic location, and

income) can be used to segment the market. Of these four segmentation variables, we chose to use the last two, geographic location and income levels, to segment the market for fortified cereal products in Botswana. We did so primarily on the basis that most food purchase decisions are made at household level. Within a family, various age groups and educational levels are likely to be encountered, which limits the usefulness of these two as segmentation variables. Table 6 shows the segmentation of the Botswana market based on income and geographic location. To evaluate the attractiveness of each segment, the segment size, growth potential, key characteristics, and buying habits must be examined. This analysis is presented in table 7. We use the marketing mix elements (product, place, price and promotion) to target the market with the potential offering of fortified products. Table 8 shows our recommended marketing mix for each market segment identified above.

**Table 6:** Market segmentation based on geographic location and income

Income level	Located in rural areas	Located in urban areas
High income	A: rural elite (1 per cent)	B: urban elite (19 per cent)
Middle income	C: rural middle class (24 per cent)	D: urban middle class (24 per cent)
Low income and vulnerable groups	E: rural poor and vulnerable (25 per cent)	F: urban poor and vulnerable (7 per cent)



Table 7: Evaluating segments

Segment	Market size and product usage	Characteristics and buying habits
A: rural elite	<ul style="list-style-type: none"> <li>• Approximately 1 per cent of the population</li> <li>• Very small segment because wealthy people prefer to live in urban areas</li> <li>• Low consumption of sorghum and millet</li> <li>• High consumption of wheat and rice products</li> </ul>	<ul style="list-style-type: none"> <li>• Most likely to purchase products from urban supermarkets</li> <li>• Low price elasticity of demand</li> <li>• High willingness to pay for fortified cereals</li> <li>• Have easy access to TV, radio, and cell phones</li> </ul>
B: urban elite	<ul style="list-style-type: none"> <li>• Approximately 19 per cent of population</li> <li>• Includes expatriate communities</li> <li>• High consumption of wheat and rice products</li> <li>• Moderate consumption of maize products</li> </ul>	<ul style="list-style-type: none"> <li>• Most likely to purchase products from urban supermarkets</li> <li>• Mostly health-conscious consumers</li> <li>• Low price elasticity of demand</li> <li>• High willingness to pay for fortified cereals</li> <li>• Have easy access to TV, radio, newspapers, and cell phones</li> </ul>
C: rural middle class	<ul style="list-style-type: none"> <li>• Approximately 24 per cent of the population</li> <li>• Decreasing owing to urban migration</li> <li>• High consumption of sorghum and millet</li> <li>• Moderate consumption of maize and wheat</li> <li>• Low consumption of rice</li> </ul>	<ul style="list-style-type: none"> <li>• Will utilise service millers and rural retail outlets</li> <li>• High price elasticity of demand</li> <li>• Low willingness to pay for fortified cereals</li> <li>• Have easy access to radio and cell phones</li> </ul>
D: urban middle class	<ul style="list-style-type: none"> <li>• Approximately 24 per cent of the population</li> <li>• Growing segment owing to urban migration</li> <li>• High consumption of sorghum, maize, and wheat</li> <li>• Low consumption of rice</li> </ul>	<ul style="list-style-type: none"> <li>• Most likely to purchase products from urban supermarkets</li> <li>• Slightly health-conscious consumers</li> <li>• High price elasticity of demand</li> <li>• Low willingness to pay for fortified cereals</li> <li>• Have easy access to TV, radio, newspapers and cell phones</li> </ul>
E: rural poor and vulnerable	<ul style="list-style-type: none"> <li>• Approximately 25 per cent of the population</li> <li>• Growing segment owing to HIV/AIDS</li> <li>• High consumption of sorghum</li> <li>• Moderate consumption of millet and maize</li> <li>• Low consumption of wheat and rice</li> </ul>	<ul style="list-style-type: none"> <li>• Will utilise service millers exclusively</li> <li>• Extremely high price elasticity of demand</li> <li>• No willingness (ability) to pay for fortified cereals</li> <li>• Limited access to all media forms</li> </ul>
F: urban poor and vulnerable	<ul style="list-style-type: none"> <li>• Approximately 7 per cent of the population</li> <li>• Growing segment owing to HIV/AIDS, urban migration, and immigration from Zimbabwe</li> <li>• High consumption of sorghum</li> <li>• Moderate consumption of millet and maize</li> <li>• Low consumption of wheat and rice</li> </ul>	<ul style="list-style-type: none"> <li>• Most likely to purchase products from small urban retailers</li> <li>• Extremely high price elasticity of demand</li> <li>• No willingness (ability) to pay for fortified cereals</li> <li>• Some access to radio; limited access to TV, newspapers, and cell phones</li> </ul>

**Table 8:** Appropriate marketing mix for each segment

Segment	Main products	Points of sale	Pricing (vs unfortified product)	Promotion
A: rural elite	Fortified maize meal Fortified wheat meal Packaged and branded	Urban supermarkets Pull distribution strategy	Premium priced (unsubsidised)	TV and radio commercials Newspaper ads Promotional sweepstakes
B: urban elite	Fortified maize meal Fortified wheat meal Packaged and branded	Urban supermarkets Pull distribution strategy	Premium priced (unsubsidised)	TV and radio commercials Newspaper ads Billboards Promotional sweepstakes
C: rural middle class	Fortified sorghum meal Fortified maize meal Both packaged and service milled	Rural retail outlets Service millers Push distribution strategy	Slightly higher than unfortified product (partially subsidised)	TV and radio commercials Newspaper ads In-school campaigns Promotional sweepstakes
D: urban middle class	Fortified sorghum meal Fortified maize meal Fortified wheat meal Packaged and branded	Urban supermarkets Small retail outlets Push distribution strategy	Slightly higher than unfortified product (partially subsidised)	TV and radio commercials Newspaper ads Billboards In-school campaigns Promotional sweepstakes
E: rural poor and vulnerable	Fortified sorghum meal Fortified maize meal Fortified millet meal Service milled	Service millers Push distribution strategy Public welfare distribution	Same as unfortified product (fully subsidised)	Radio commercials Billboards In-school campaigns Health care providers
F: urban poor and vulnerable	Fortified sorghum meal Fortified maize meal Both packaged and service milled	Small urban retail outlets Service millers Push distribution strategy Public welfare distribution	Same as unfortified product (fully subsidised)	Radio commercials Billboards In-school campaigns Health care providers

## 7 THE WAY FORWARD

In developing a plan for the fortification of cereals in Botswana in the future, it is important to first examine the progress that other countries in the region have made in this regard. Against this background we recommend some steps that will be critical in developing a market-based national programme for milled cereals in Botswana.

### 7.1 Regional strategies, policies and practice

While African governments are officially committed to the Millennium Development Goals, achieving these by the target date of 2015 may prove to be a very difficult task for many. The development and implementation of frameworks or policies to achieve basic food security and food fortification under Pillar 3 of NEPAD's CAADP have met with varied success. Some countries have developed extensive policies and programmes and are on schedule in terms of meeting their goals, while others still have some way to go in developing and implementing programmes to honour their commitments. The diversity among countries in implementing food security and food fortification programmes is especially evident in the Southern African region. All ten countries in the region have introduced formal policies and legislation regarding the mandatory iodisation of salt, while only South Africa and Zambia have already introduced formal legislation governing food fortification. Table 9 summarises the formal policies and legislation and the institutional arrangements, processes and the setting of standards in selected countries in the Southern African region.

**Table 9:** Food fortification policies and legislation in selected Southern African countries

	Formal policies and legislation	Institutional arrangements, processes, and standard setting
Angola	No government requirement that food products be fortified. Salt iodisation is mandatory.	WFP and other parties are considering the fortification of emergency food supplies, but given that there are a variety of mini-mills in operation and that the country's main grain mills are still in urgent need of rehabilitation, it is likely to take some time before this can be done locally. The current focus is on encouraging the growth and processing of vitamin- and mineral-rich crops and other edibles.
Botswana	Food Control Act of 1993 provides for iodisation; additional legislation in draft (2001), salt iodisation is mandatory.	Bureau of standards is preparing fortification standards for local industry. No legislation regarding the fortification of foodstuffs, but such legislation is being considered. Participating in a regional iodisation programme, aimed at ensuring that all salt consumed in the country is adequately iodised.
Lesotho	The only legislation currently in force relates to the fortification of salt with potassium iodide at 40 to 60 parts per million. Salt iodisation is mandatory.	Within the Ministry of Agriculture, the Food and Nutrition Coordinating Office is responsible for the development of policy and the coordination of programmes relating to food fortification. Lesotho obtains fortified salt from South Africa. The Micronutrient Committee is studying the need for food fortification in Lesotho, and, more important, the methods of delivery. The proposed delivery of fortified maize meal in Lesotho is complicated by the fact that much of the maize meal in rural areas is derived from small hammer mills, and additives will therefore have to be delivered at village level.

Mozambique	Salt iodisation is mandatory.	Much of the food aid is fortified, including edible oils imported mainly from the USA, corn soy blend, and salt. In addition, WFP supplies of maize meal are fortified. The WFP works with several government ministries in Mozambique, as well as with a number of NGOs for the delivery of food.
Namibia	All salt in Namibia for both human and animal consumption must be iodised. Salt iodisation is mandatory.	Vitamin A and iron supplements are administered at antenatal clinics and other health centres in the country.
Swaziland	Salt iodisation is mandatory.	The industry has for some time been discussing the fortification of sugar through the addition of vitamin A. A study by UNICEF on behalf of the government has made recommendations to this effect. The report been referred to SADC level owing to complaints that fortification would be a non-tariff barrier and would hinder access to SACU markets.
Zimbabwe	The iodisation of salt is already regulated. Salt iodisation is mandatory.	The Food and Nutrition Council of Zimbabwe coordinates programmes and food fortification initiatives. It is establishing of a formal set of regulations for food fortification and micronutrient programmes. In this regard, it works closely with the Ministry of Health, which is largely responsible for the implementation of programmes.

Adapted from Organisation Ouest Africaine de la Santé, 2007

Based on the analysis of regional policies it is evident that many governments have some way to go in developing and implementing policies and programmes to ensure basic food security and food fortification as part of their commitment towards the Millennium Development Goals to which they are bound. NEPAD has foreseen the growing need to support governments in their efforts to achieve their goal, and through its CAADP has placed at the disposal of African governments many frameworks and tools for developing and implementing the necessary policies and programmes as discussed earlier. To fulfil their commitment to the Millennium Development Goals, governments need to make use of the tools at their disposal and engage NEPAD's CAADP and all local stakeholders to develop and implement not only legislation, but also programmes to support the legislation with regard to food security and food fortification.

The case is made that sufficient frameworks and policies already exist at continental level through the AU and NEPAD's programmes aimed at food security and fortification, and that no major departures from these are necessary. However, action on the part of national governments is required to make the necessary changes in local legislation while creating incentives for private sector participation.

## 7.2 Towards a market-based national programme for milled cereals in Botswana

Considering the successes and failures in neighbouring countries, and combining these with the analysis presented in this paper, we conclude by recommending the following five steps for the development of a market-based national programme for milled cereals in Botswana.

1. **Conduct a national nutrition survey:** Currently in Botswana, successful cereal fortification is feasible only with the explicit and extensive involvement of government and public institutions to complement private sector initiatives. Before such a large-scale project is undertaken, however, we recommend a detailed, in-depth, country-wide nutrition survey to gain a thorough understanding of the nutritional needs of the population, and thus the potential effects and possible benefits of fortification.
2. **Encourage the involvement of all interested parties:** If the national nutrition survey confirms that cereal fortification is a sensible and feasible public health initiative for Botswana, the next step should seek commitments from the various stakeholders through a public engagement campaign by the Botswana Fortification Alliance (BFA), consisting of public and private sector stakeholders.

3. **Develop and enforce standards:** In consultation with stakeholders, the government needs to develop a set of standards that will govern fortification and the marketing and sale of fortified milled products. These standards would include production standards, quality control, labelling requirements, monitoring, and measures for their enforcement.
4. **Conduct further research on fortification technology:** Much of the technology required for fortification is already available for large and medium-sized millers producing branded products. Certain challenges remain, however, when it comes to involving smaller and service millers in the production of fortified cereals, as smaller and service millers do not necessarily possess the processing equipment and storage facilities, or the capacity to acquire them, that would allow them to utilise the same technologies as more technologically sophisticated production facilities.
5. **Consumer education:** The general public knows little about the fortification of cereals; this factor may be responsible for the limited willingness to pay for fortified foods. Therefore, the government's fortification plan must include an extensive public engagement campaign also directed at consumers to create awareness of the benefits of, and indeed the need for, cereal fortification and its implications for long-term health.

## NOTES

- 1 Dr Edward Mabaya is a research associate in the Department of Applied Economics and Management at Cornell University. Mr Danie Jordaan is the Regional Agribusiness Coordinator for Market Matters Inc. Dr Patrick Malope and Mrs Milly Monkhei are lecturers in the Department of Agricultural Economics at the Botswana College of Agriculture. Dr Jose Jackson, a food scientist, is the Deputy Director of the Office of Research and Development at the University of Botswana.
- 2 Firm size is based on monthly output. Small = 0 to 20 metric tons; medium = 20 to 100 metric tons; large = over 100 metric tons.
- 3 During the period of this research (May–September 2007) the average exchange rates between the Botswana pula and major currencies were as follows: 1 Botswana pula = 1.15913 South African rand = 0.16619 US dollars.

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